

WQB "Wide Aperture Quad" for Main Injector

1 September 2005, 9:00 AM

IB2 conference room

Attendees: Linda Alsip, Weiren Chou, Joe DiMarco, TJ Gardner, Hank Glass, Dave Harding, Jim Jablonski, Vladimir Kashikhin, Ioanis Kourbanis, Bill Robotham, John Zweibohmer

Design

Bill showed the measured deflection of a beam tube under vacuum. Except at the ends, where there is better support, the decrease across the shortest distance (diagonally in the magnet) is about 40 mil. The drawing dimensions show a few mils clearance in the relaxed state, but there is enough twist and bow that so far we have had a snug fit. To ensure that the tube does not move, we will add material to the pole face on the remaining magnets and will devise some sort of wedge for the ends of the magnets that are already assembled.

Measurements

Hank reported that the thermal performance of the water-cooled crossover bus was as expected. It does not limit the magnet current. To within the errors of the flow meter and other equipment, the water is taking away the power dissipated at 4000 A. There is enough thermal mass so that the desired measurements will be executable.

Hank showed a separation of the body and end harmonics. The body and end contributions are comparable in size and small. It was noted that only the 12-pole was allowed and thus expected to repeat on subsequent magnets. The rest are minor fabrication errors.

Joe had measured the field shape of WQB002 at 2800 A out to about 65 mm using the single stretched wire system. The value reported at each position is averaged over 5 mm. The field is very linear out to at least 45 mm, then starts to diverge. Between 45 and 50 mm the field differs by less than a unit (one part in 10^4) from linear. From 50 to 55 mm it differs by about 7 units. This appears to meet the acceptance criterion, but we wait to pass final judgment until we have the confirming shape measurements from the harmonics probe.

Dave had tried fitting the deviations from linear with a single power law. He found a 32-pole or 36-pole worked equally well. Vladimir reminded us that the magnetic model showed a 32-pole component of the field. The 32-pole is not directly observable with the standard Morgan coil that is being used. [Note added in press: The 30-pole is observable as the third harmonic of the 10-pole and the fifth harmonic of the 6-pole. Measuring the 30-pole at multiple locations would give a good measure of the 32-pole. This is only possible to do with the extra length probe at three locations. The shorter probe does not require a center support and thus gives more flexibility in positioning.] In any case, the far edges of the aperture are not reachable with the rotating coil.

From here the measurement plan will include

1. Measure the excitation curve and harmonics on center up the ramp to 4000 A. Same collection of currents as was used in production on the IQD and other quads.
2. Measure the excitation and harmonics using the trim coil at currents from 0 to 28 A in 4 A steps and with the main coil off.
3. Off-center harmonics left and right up the ramp.

4. SSW scans *approximately* at injection, 120 GeV, 150 GeV, and some intermediate current. Per the TDH, the nominal current for 150 GeV is 3630 A, 120 GeV is 2900 A, and injection is 215 A. We take 1000 A as our intermediate point current. Precise currents will be chosen to match currents at which full harmonics are measured.

Procurement

The BPM's have formally slipped to 14 September.

Fabrication

WQB001 is at MTF.

WQB002 Is being retrofitted with the water-cooled bus.

WQB003 is being manifolded with the water-cooled bus.

WQB004 is being assembled, with two quarters in the fixture and the other two ready to add..

WQB005 has all four coils wound and wrapped. Two coils should pot today. Two cores and two trim coils are complete.

WQB006 has three main coils wound and one insulated.

WQB007 has not been started

Schedule

The schedule now shows the completion of four magnets by Oct 21, 2005 and seven magnets by Nov 4, 2005.

Next meeting will be 8 September 2005 at 9:00 in the Industrial Building 2 conference room.